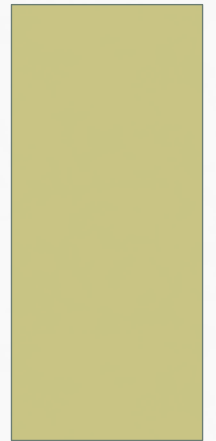


# POSTERIOR CERVICAL SCREW CLASSIFICATION

NORTH AMERICAN SPINE SOCIETY



# HISTORY OF POSTERIOR CERVICAL FIXATION

Spinous process wiring for Pott's Disease

Hadra BE, Transactions of AOA 1891: 4, 206.

Sublaminar wiring for atlantoaxial instability

Brooks AL & Jenkins EB, J Bone Joint Surg (Am) 1978: 60, 279.

Contoured metal loop/wiring for occipitocervical instability

Ransford AO et al, J Bone Joint Surg (Br) 1986: 68, 173.

Posterior lower cervical screw/plate for traumatic spine injury

Domenella G et al, Ital J Orthop Traumatol 1982: 8, 235.

Honnart F et al, Ann Acad Med Singapore 1982: 11, 186.

Roy-Camille et al, Cervical Spine 1987: 163.

Cooper PR et al, Neurosurgery 1988: 23, 300.

Ebraheim NA et al, J Orthop Trauma 1989: 3,23.

Contoured plate/screw fixation for occipitocervical instability

Smith MD et al, Spine 1993: 18, 1984.

# POSTERIOR CERVICAL BONE SCREWS

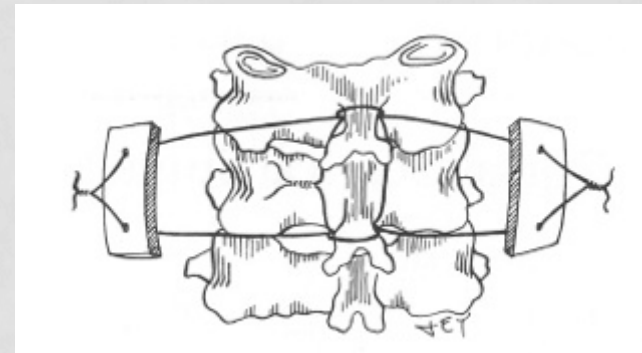
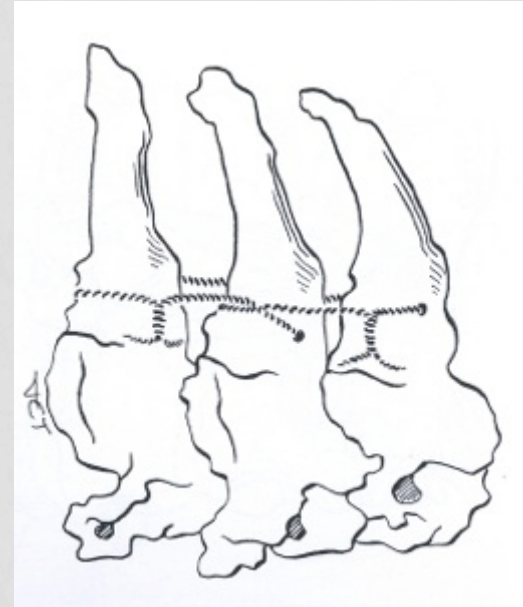
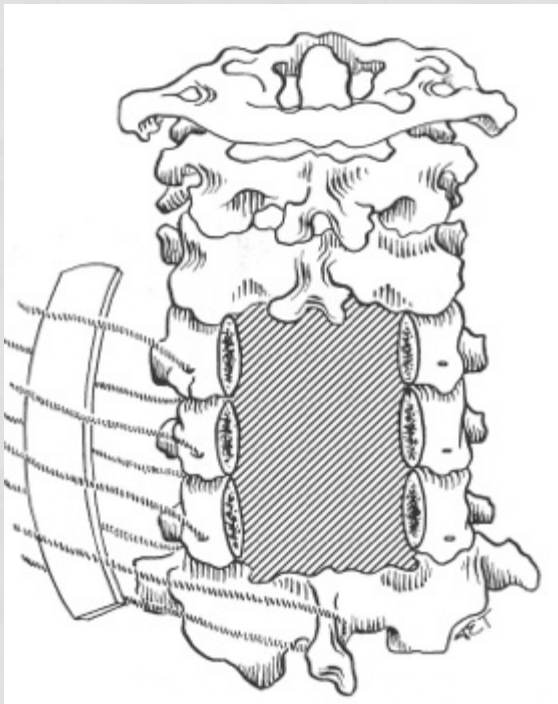
- More than three decades of surgical experience
  - Described in 1980's by Roy-Camille and Magerl
  - Initially applied to treatment of traumatic cervical spine injury
  - Biomechanically similar or superior to available alternatives
    - Gill K et al, Spine 1988: 13, 813.  
Wiring, clamping, 2 lat mass screw fixation techniques in cadavers  
Plate/bicortical screw fixation stiffest
    - Mihara H et al, Spine 2001: 26, 1662.  
3 Wiring, 1 lat mass screw fixation technique compared in cadavers  
Similar restoration of biomechanical stability
    - Richter M et al, Spine 2002: 27, 1724.  
1 Wiring, 3 transarticular screw, 1 isthmic screw, 1 lat mass screw in C1C2  
Transarticular screw fixation best, isthmic and lat mass screw good biomechanical alternatives

# POSTERIOR CERVICAL BONE SCREWS

- More versatile than available alternatives
  - Cervical bone screws offer more options compared with wiring
    - Applicable when spinous process/laminar fractures/defects present
    - Allows for sparing of motion segments
  - Cervical bone screws replace inadequate alternatives
    - Methylmethacrylate fixation
    - Several hook techniques

# DORSAL CERVICAL FIXATION TECHNIQUES

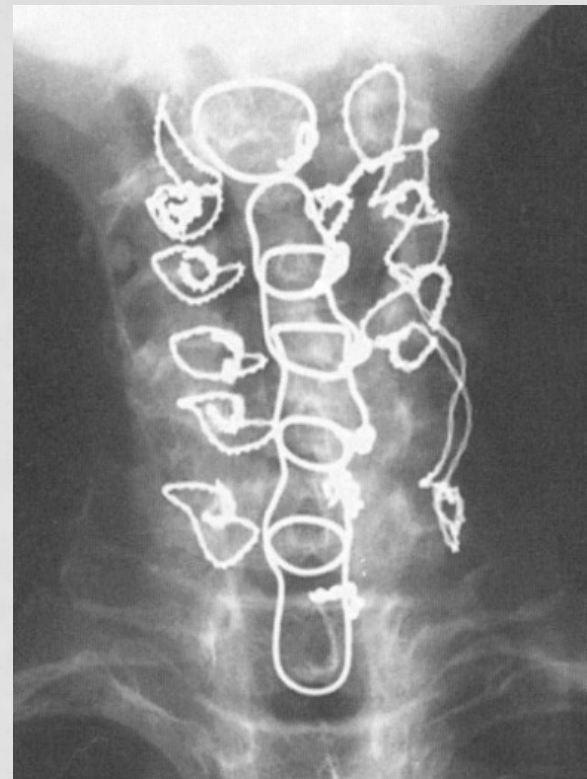
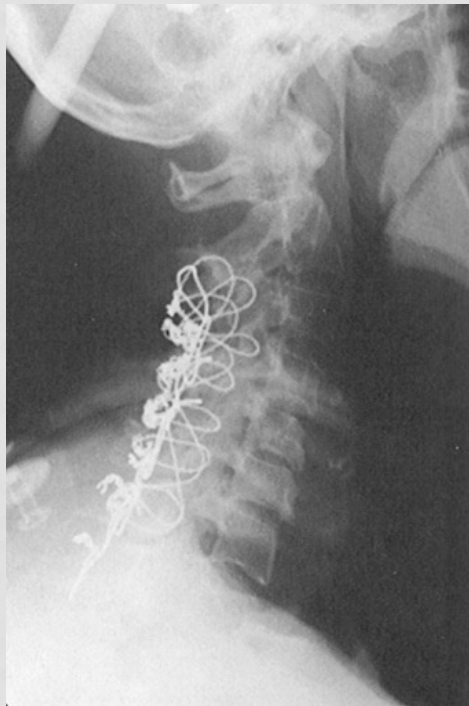
- Wiring Techniques
  - Interspinous
  - Facet
  - Triple Wire





# POSTERIOR CERVICAL WIRING LIMITATIONS

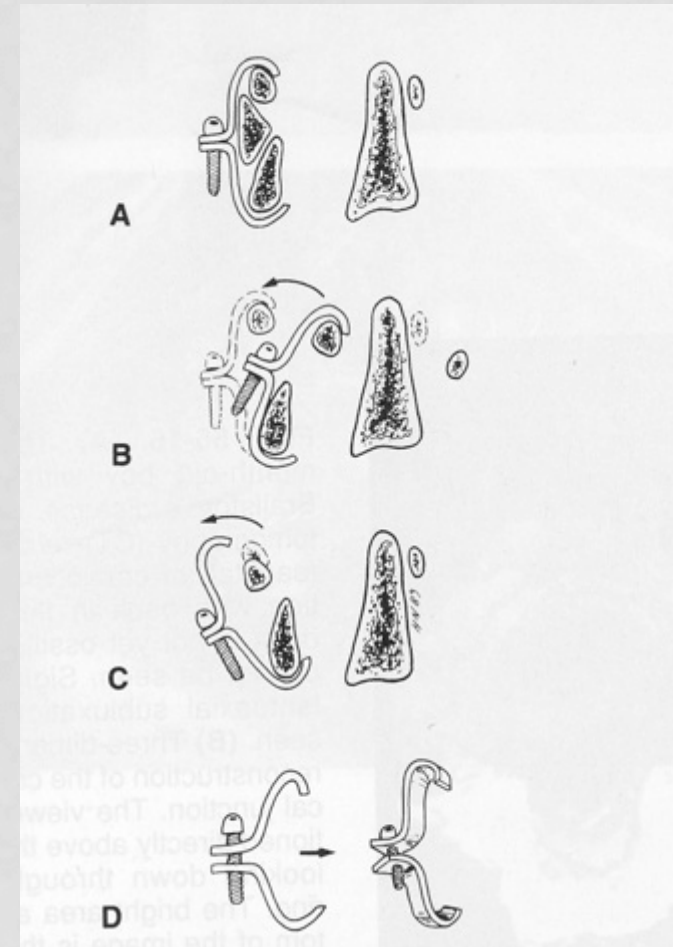
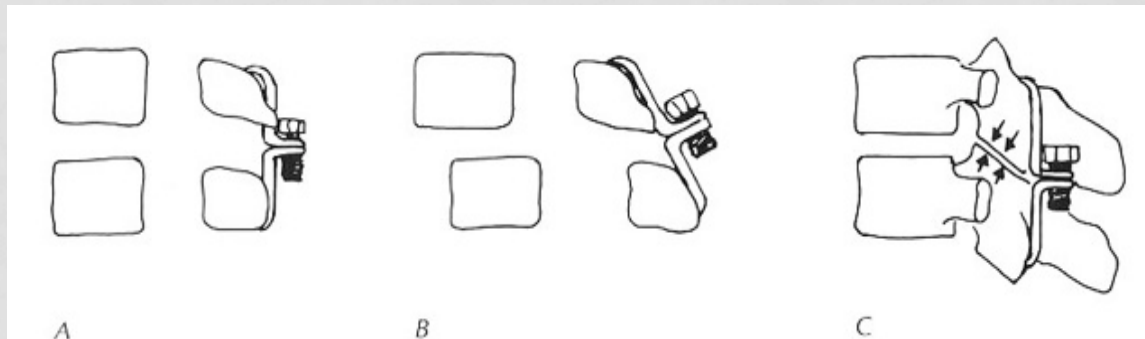
- Tension band resists flexion
- Poorly resists rotation
- Doesn't resist extension



# CERVICAL CLAMP TECHNIQUES

## LIMITATIONS

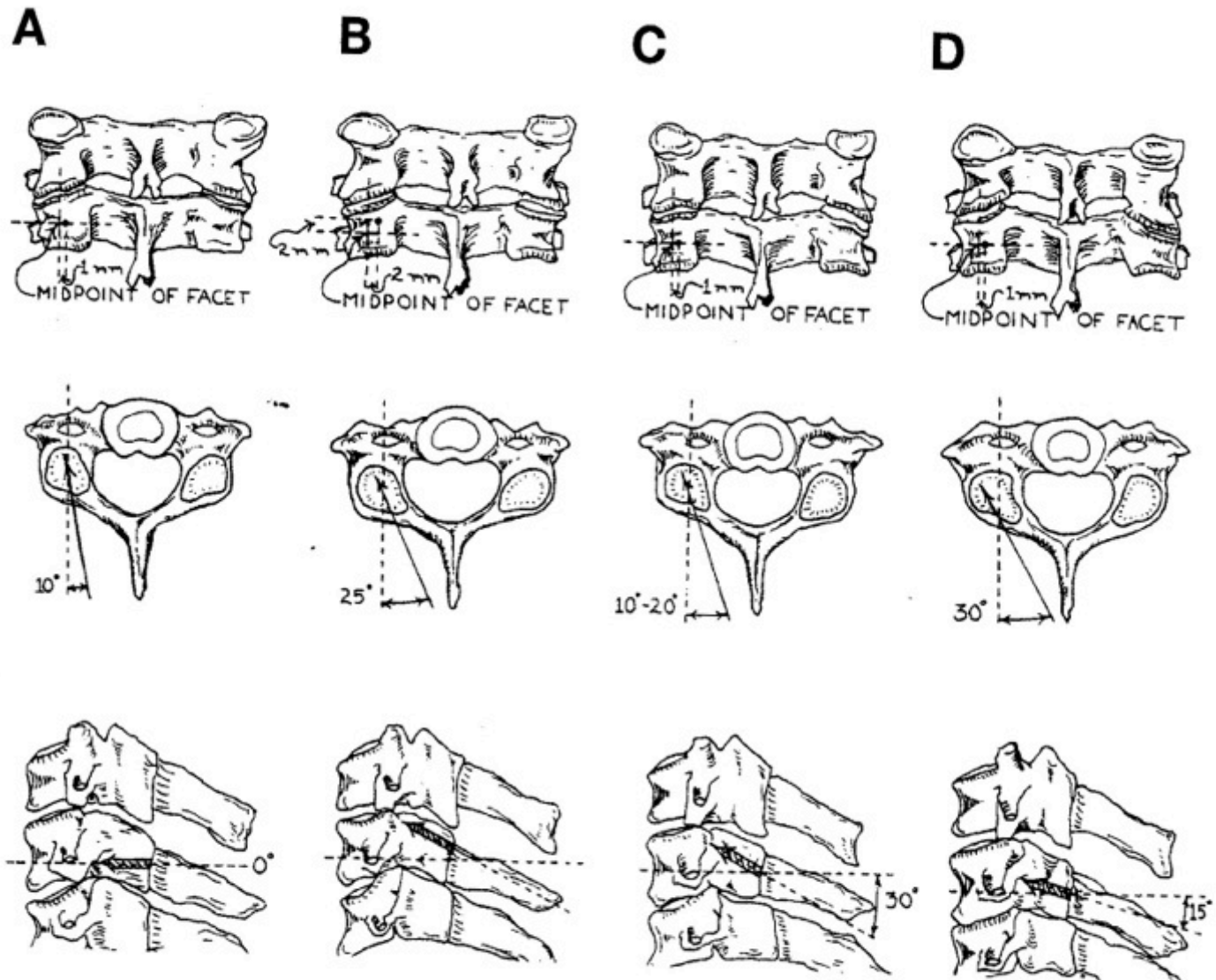
- Biomechanics of clamps similar to that of wiring techniques:  
Tension band only
- Does NOT intrinsically resist translation or rotation



# POSTERIOR CERVICAL BONE SCREWS

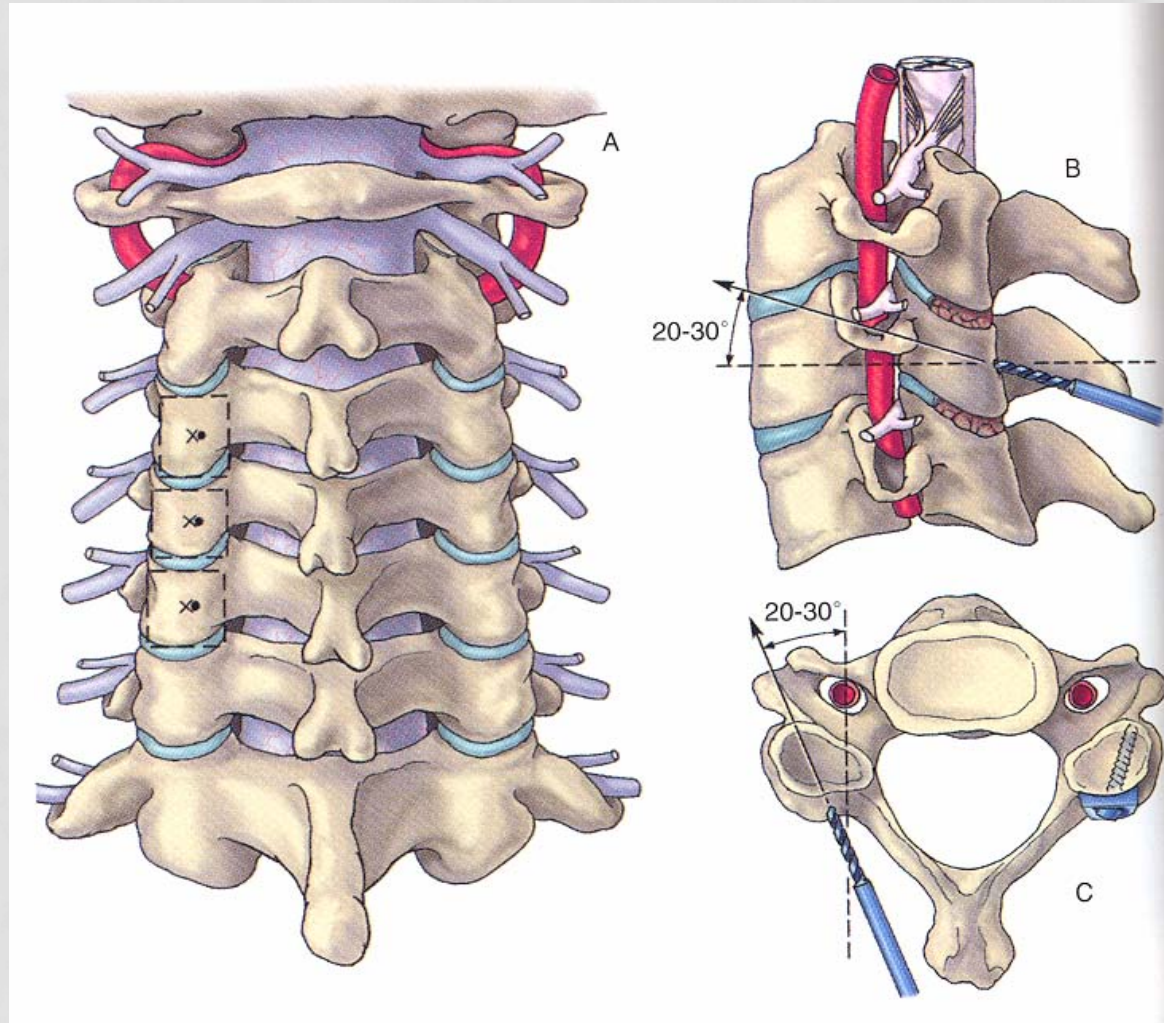
- Commonly applied and commonly reported
  - Pubmed search “posterior cervical bone screw”: 1530 references
  - Pubmed search “lateral mass screw” : 564 references
  - Other posterior cervical screw applications include:
    - Transarticular screws (across C1-2)
    - Pars interarticularis screws (at C2)
    - Pedicle screws (typically at C2 or C7)





**Figure 6.** Technique for lateral mass screw placement for the (A) Roy-Camille, (B) Magerl, (C) Anderson, (D) An. (Reprinted with permission.<sup>39</sup>)

# POSTERIOR CERVICAL LATERAL MASS ANATOMY



# C7 PEDICLE SCREWS





# C1 LATERAL MASS C2 PEDICLE SCREW

- C1-2 Instability
  - Strength of construct similar to that of transarticular screws
  - Easier to apply
  - Provides alternative avenue of fixation



# SAFE AND EFFECTIVE TECHNIQUE

- Neurovascular injuries are infrequent
  - Unusual with lateral mass screws
    - Heller JG et al, Spine 1995: 20, 2442.  
654 facet screws in 78 patients  
No vertebral artery injury, 0.6% nerve root injury
    - Sekhon LH, J Spinal Disord Tech 2005: 18, 297.  
1026 consecutive facet screws in 143 patients  
No vascular/ neurological injuries
    - Inoue et al, Arch Orthop Trauma Surg 2012: 132, 947.  
457 facet screws in 97 patients  
No serious vascular/ neurological injuries
  - 1-4% with C1-C2 transarticular screws
  - 1-5% with subaxial pedicle screws (C3-6 insertion infrequent in US)



# SAFE AND EFFECTIVE TECHNIQUE

- Arthrodesis (fusion) rates very high
  - 85-100% at C1-2
  - 90-100% subaxial spine (C3-C7)
    - Katonis et al, J Spinal Disord Tech 2011: 24, 415.

# POSTERIOR CERVICAL SCREW FIXATION

- Safe and Effective
  - Low rate of neurovascular injury in lat mass and pedicle fixation
- Comparable to other pedicle screw applications
  - Similar to Class II thoracolumbar pedicle screw fixation
- Studied in a variety of clinical conditions:
  - Trauma, neoplasm, degenerative disease, myelopathy
- Application when other techniques not feasible
  - Laminar/spinous process fracture, laminectomy
- Class II designation (from unclassified) clinically justified
  - Cervical screw fixation is as safe and effective as predicate